METHODS AND APPARATUS FOR MODEL BASED DIAGNOSTICS

ABSTRACT OF THE DISCLOSURE

Systems and methods for performing module-based diagnostics are described. In an exemplary embodiment, sensor values from an actual engine plant are input to an engine component quality estimator which generates performance estimates of major rotating components. Estimated performance differences are generating by comparing the generated performance estimates to a nominal quality engine. The estimated performance differences, which are indicative of component quality, are continuously updated and input to a real-time model of the engine. The model receives operating conditional data and the quality estimates are used to adjust the nominal values in the model to more closely match the model values to the actual plant. Outputs from the engine model are virtual parameters, such as stall margins, specific fuel consumption, and fan/compressor/turbine efficiencies. The virtual parameters are combined with the sensor values from the actual engine plant in a fault detection and isolation classifier to identify abnormal conditions and/or specific fault classes, and output a diagnosis.